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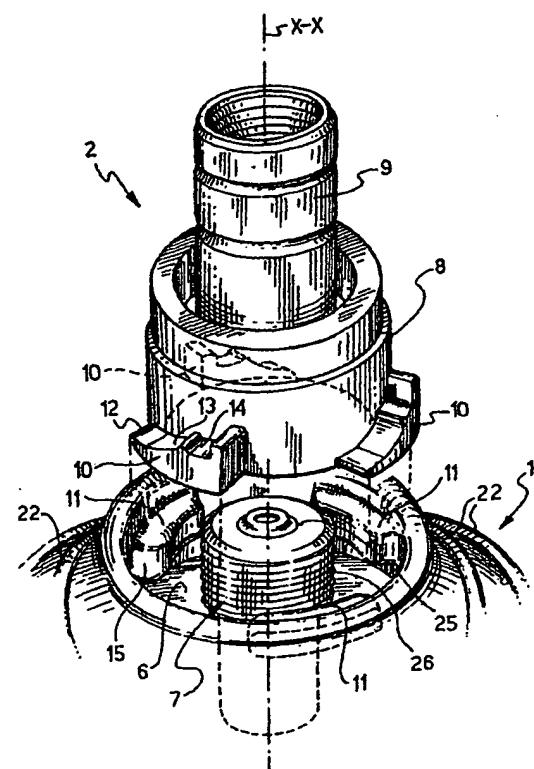
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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(54) Title: CARTRIDGE CONNECTING SYSTEM FOR COMBUSTIBLE GAS DISTRIBUTORS



(57) Abstract: In a cartridge connecting system for combustible gas distributors, wherein the connecting means (2) is connected to a delivery means of the distributor and wherein the cartridge (1) is detachably secured to the connecting means (2), the cartridge (1) is secured to the connecting means (2) by means of a bayonet coupling (6, 8, 10-15), which has proved to be simple, rapid and efficacious.

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.1.

Cartridge connecting system for combustible gas distributors"

DESCRIPTION

The subject of the present invention is a cartridge connecting system for combustible gas distributors.

From International Application PCT WO 97/42446, for example, combustible gas distributors are known, each of which employs a plurality of single-use cartridges containing the combustible gas. Said cartridges have restricted dimensions and a limited capacity, for example of the order of a litre. The distributor comprises a plurality of connectors connected to a common manifold which is in turn connected to a delivery device; each cartridge is connected to a respective connector, and valve members of the distributor provide for enabling or otherwise the communication of one or more cartridges with the delivery device. Each connector is provided with a hollow needle which perforates the cartridge and thus permits the flow of gas from inside the cartridge to the delivery device through the valve members, or alternatively the connector comprises a hollow pin which opens a valve of the cartridge and permits the aforesaid flow of gas from the cartridge to the delivery device. Once they are exhausted, the cartridges are removed from the respective connectors and replaced by new cartridges.

.2.

In the simplest case, the distributor employs a single cartridge housed in a suitable support provided with a delivery device; the cartridge is coupled to the delivery device by way of a connector provided with a 5 needle or pin exactly as seen above in the multi-cartridge distributors. Said simple distributor is provided, as is well known, in portable apparatuses such as, for example, gas stoves with single burner or gas lamps.

10 In the above-mentioned distributors with single cartridge or several cartridges, the cartridge is coupled to the connector by screwing.

However, the screw coupling is such that the user has to give several turns to the cartridge to secure it to or 15 detach it from the connector. That is clearly laborious, especially in the case of the distributor with several cartridges.

Moreover, the length of the rotation action may cause the operator not to reach the end of the travel, so that 20 the seal between cartridge and connector may be imperfect and the anchorage of the cartridge to the connector may be unstable.

Aim of the present invention is to remedy the aforesaid drawbacks.

25 That aim is fulfilled by means of a cartridge

.3.

connecting system for combustible gas distributors, wherein the connector is connected to a delivery means of the distributor and wherein the cartridge is detachably secured to the connector, characterized in that the 5 cartridge is secured to the connector by a bayonet coupling.

The invention will become clear from the following description of one of its non-limiting exemplary embodiments, in which:

10 Figure 1 is an exploded perspective view of a cartridge connecting system for combustible gas distributors according to the invention;

Figure 2 shows an enlarged detail of the system in Figure 1;

15 Figure 3 shows the detail of Figure 2 in a mounted configuration and partly in section;

Figure 4 shows according to another perspective angle, and partly in section, the bottom of the cartridge in Figure 1;

20 Figures 5 to 13 show, in axial section, valve members of the system in Figure 1 in various operating states.

Figure 1 illustrates a cartridge 1 adapted to be charged with combustible gas and intended, together with other identical cartridges, to be used in a combustible 25 gas distributor, not shown; in said drawing there is

.4.

further illustrated a connector 2 for the cartridge 1, adapted to be incorporated in the distributor together with other identical connectors for the other cartridges.

The cartridge 1 is formed of a cylindrical container 3 with base 4 of smaller diameter and of a hemispherical dome 5 which closes the container 3 at the top. At the vertex of the dome 5 there is provided a hollowed-out cylindrical seat 6, in which is axially inserted a valve 7. Round the seat 6, in proximity thereto, a series of 10 concentric circular ribs 22 is provided.

The connector 2 provides a hollow connecting head 8 and a hollow shank 9 which extends from the head 8. The shank 9 is internally threaded to be fixed by screwing, together with the other connectors, to a manifold of the 15 distributor, connected in its turn to a delivery device of the latter. The head 8 is adapted to be received in the seat 6 of the cartridge 1.

The cartridge 1 and the connector 2 are coupled by means of a bayonet coupling. To produce the bayonet 20 coupling, as shown in detail in Figures 2 and 3, the head 8 of the connector 2 provides an annular series of projections 10 and, correspondingly, the seat 6 of the cartridge 1 has an annular series of reliefs 11, each of which couples with a respective projection 10 of the 25 connector 2. In particular, each projection 10 of the

.5.

connector 2 provides a surface for contact with a respective relief 15 of the cartridge 1, and said contact surface comprises, in succession, a first portion 12 lying substantially in a plane perpendicular to the axis 5 X of the connector 2, a second portion 13 inclined with respect to said plane, and a third portion 14 shaped as a recess; each relief 11 of the seat 6 of the cartridge 1, on the other hand, provides a shaped engagement portion 15 adapted to be inserted into the recess portion 14.

10 With reference to Figure 5, the valve 7 of the cartridge 1 comprises a cup-shaped body 16, the bottom of which has a hole 17 which places the inside of the cartridge in communication with the inside of said body; above, the body 16 is closed at the top by a gasket 18 15 having a central hole 19 which permits the access of a suitable member to the inside of the body as will be seen hereinafter. In said body 16 there is received a hollow closure means 20 held pressed against the gasket 18 by a spiral spring 21, a portion of which partly wraps round 20 the closure means. The spring 21 has a constriction 23 in which a ball 24 is retained.

The body 16 of the valve 7 is received in a hollow cylindrical portion 25 of the dome 5, which substantially represents a sort of outer jacket of the valve itself. 25 The portion 25 has on the outer lateral surface a thread

.6.

26 and has an upper part which locks the gasket 18 against the opening of the body 16; said upper part has a hole 27 aligned with the hole 19 of the gasket 18.

The dome 5 is rigidly connected to the container 3 by 5 means of double seaming.

With reference to Figure 4, the bottom 28 of the container 3 has a convexity towards the inside of the container itself. Moreover, the lower edge 29 of the base 4 of the container 3 is formed into a kerb by means of 10 suitable folding back of the connecting portion between base 4 and bottom 28.

With reference to Figure 10, the connector 2 houses inside its hollow head 8 a pin 30 integral with the head itself. In the pin 30 is provided an axial conduit 31 15 which communicates on one side with a transverse hole 32 provided at one end of the pin and leading into the cavity of the head 8; on the other side the conduit 31 communicates with a conical seat 34 provided also in the pin and opening into the cavity of the shank 9. In the 20 seat 34 is received a ball closure means 35. In the cavity of the head 8, at the level of the pin 30, there is housed a sealing ring 36. In the shank 9 is provided a diaphragm closure means 37 held resiliently against a seat 38 by a spiral spring 39 anchored to the inner wall 25 of the shank. Moreover, in the shank 9, at the level of

.7.

the seat 38 in an opposed position with respect to the seat 34 of the pin 30, a further conical seat 40 is provided, adapted to receive the ball 35 under certain operating conditions, as will be seen hereinafter.

5 The operation of the cartridge connecting system described above is as follows.

First of all, with reference to Figures 6 and 7, the combustible gas is loaded into the cartridge by means of a suitable apparatus of known type, not illustrated as a 10 whole, which comprises a charging nozzle A having internally an axial conduit B which communicates at the end of the nozzle with a transverse hole C leading to the outside. For charging (Fig. 6), the nozzle A is inserted into the aligned holes 27 and 19 of the valve 7 of the 15 cartridge (indicated in Fig. 5) so that said nozzle is inserted partially into the hollow closure means 20 of the valve 7 and moves it away from the position of closure of the valve 7 against the action of the spring 21. At this point, the combustible gas is caused to flow 20 from the charging apparatus into the cartridge through the conduit B and the hole C of the nozzle A, the inside of the body 16 of the valve 7, and the hole 17 of said body. Once the cartridge is charged with combustible gas, the nozzle A is inserted further into the valve 7 until 25 the closure means 20, pushed downwards by the nozzle,

.8.

disengages the ball 24 from the constriction 23 of the spring 21 (Fig. 7). Once it is disengaged, the ball 24 moves into the hole 17, and at this point the nozzle A is extracted from the holes 19 and 27 of the valve 7 and the 5 spring 21 returns the closure means 20 to the position of closure of said holes.

With reference to Figures 2 and 3, to connect the cartridge 1 to the connector 2, the cartridge is positioned on the connecting means so that the hollowed-out seat 6 of the cartridge is placed on the head 8 of the connecting means with the projections 10 of the head arranged on the bottom of the seat 6 of the cartridge in the spaces between the reliefs 11 of said seat. At this point the cartridge 1 is rotated in a clockwise direction 10 about the axis X with respect to the connector 2 so that the projections 10 wedge between the reliefs 11 and the bottom of the seat 6 of the cartridge, and each relief 11 is engaged with a respective projection 10 owing to the insertion of the shaped engagement portion 15 of the 15 relief 11 into the recess portion 14 of the projection 10 (Fig. 3). The portions 12 and 13 of the projections 10 constitute lead-in sections for the engagement. As shown in Figure 11, when the head 8 of the connector 2 enters the seat 6 of the cartridge 1, the inner pin 30 of the 20 connector is inserted into the holes 19 and 27 of the 25 valve 7.

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In the normal flow of combustible gas from the cartridge 1 to the connector 2, the ball 35 remains suspended in an intermediate position between the seat 34 and the opposed seat 40 of the connector and functions as 5 a flow limiter.

In the event that the pressure of the combustible gas issuing from the cartridge 1 is excessive, as shown in Figure 12, the ball 35 is pushed by the actual pressure of the gas against the seat 40 of the connector 2 so as 10 to prevent the flow of gas under over-pressure to the distributor.

In the case where the cartridge 1 and the connector 2 are accidentally turned upside down, as shown in Figure 13 the ball valve 35 fits against the seat 40, preventing 15 the combustible gas, and in particular its liquid phase, from reaching the distributor.

As shown in Figures 11, 12 and 13, the gasket 36 is interposed between the outer jacket of the valve 7 of the cartridge 1, i.e. the cylindrical portion 25 (indicated 20 in Fig. 5) of the dome 5, and the inner wall of the head 8 of the connector 2, so as to prevent the escape of gas to the outside when the cartridge is connected to the connector, in addition to the gasket 18.

When the cartridge 1 is discharged, for replacement 25 it is disconnected from the connector 2 by rotation in

.11.

the anti-clockwise direction of the cartridge with respect to the connector, followed by removal from the connector. The angle of anti-clockwise rotation is of course about 60°, or equal to and of opposite direction 5 to the angle of rotation for the connection of the cartridge 1 to the connector 2. During disconnection of the cartridge from the connector, the pin 30 of the connector emerges from the valve 7 and the hollow closure means 20 returns to the valve closure position (Fig. 5).

10 As will be understood from Fig. 10, once the cartridge is disconnected from the connector 2, if there is pressurized combustible gas present in the distributor coming from other cartridges, this cannot escape from the connector owing to the diaphragm closure means 37 15 maintained by the spring 39 in the position of closure of the passage of gas inside the shank 9 of the connector. If for some reason the diaphragm closure means 37 does not provide a seal, the gas would then be blocked by the ball 35 which the actual pressure of the gas would 20 maintain against the seat 30 of the connector, preventing communication between the inside of the shank 9 and the inside of the head 8, and therefore the escape of gas from the connector.

Once discharged, the cartridge 1 must be discarded 25 and cannot be re-filled. As illustrated in Fig. 9, if an

.12.

attempt is made to re-fill the cartridge by inserting a nozzle, still indicated by A, of a charging apparatus, the pressure of the gas which enters the valve 7 pushes the ball 24 into the hole 17 so that the latter is 5 obstructed and the gas cannot flow inside the cartridge.

The cartridge connecting system described above has various advantages.

First of all, the connection seen between cartridge 1 and connector 2 proves to be particularly simple, rapid 10 and efficacious in that a minimal rotating action is required for connection, and moreover the engagement between the projections 10 of the connector and the reliefs 11 of the cartridge guarantees a high stability of connection and therefore reliable sealing. 15 Preferably, the angle of rotation for the connection of the cartridge to the connector is not more than 60°.

As can be seen, the ball closure means 35 and the diaphragm closure means 37 of the connector 2 guarantee maximum safety with the cartridge detached, preventing 20 escapes of combustible gas from the connecting means; moreover, the ball closure means 35 guarantees further security by preventing the flow of gas under over-pressure or in liquid phase to the distributor; and finally the ball closure means 35 advantageously 25 functions as a flow limiter.

.13.

The ball 24 of the valve 7 of the cartridge 1, as can be seen, prevents fraudulent re-filling of the discharged cartridge.

It should be added that both the structure of the 5 cartridge 1 and the structure of the connector 2 are simple and therefore constructionally economical. In fact, the body of the cartridge 1 is formed of only two parts, i.e. the cylindrical container 3 and the dome 5; the valve 7 of the cartridge and the connector are also 10 formed of few parts. A part of the dome 5, the hollow cylindrical portion 25 forms, as can be seen, the outer jacket of the valve 7. The other components of the valve 7 can be mounted simply in said cylindrical portion 25.

The fact that the cartridge 1 is produced in only two 15 parts double seamed to one another makes it possible to make it very resistant to the stresses due to the pressure of the combustible gas which is loaded into it. The concentric circular ribs 22 of the dome 5 increase the robustness of the dome itself at the level of the 20 connecting area, where the stresses are particularly accentuated. The kerbed edge 29 of the base 4 of the cartridge increases the robustness of the base itself.

The base 4 of smaller diameter allows the cartridge to be grasped and easily connected to the connector 25 without interfering with the other adjacent cartridges

.14.

mounted in the distributor.

The thread 26 of the outer jacket 25 of the valve 7 of the cartridge 1 makes it possible to connect the cartridge itself to conventional screw connectors.

5 It is clear that variants and/or additions to what is described and illustrated above may be provided.

The general configuration of the cartridge and of the connector may vary.

It is possible to provide bayonet coupling elements 10 of the cartridge connecting system with functions equivalent to the elements described and illustrated above, even though the latter have proved particularly simple and reliable.

The hollow closure means 20 and the diaphragm closure 15 means 37 may be replaced by closure means of various configurations having the same function.

The closure balls 24 and 35 may also be replaced by closure elements performing the same function, for example pistons guided in suitable seats.

20 The cartridge connecting system seen above may of course be applied also to a distributor provided with a single connector and therefore employing a single cartridge. Said system proves to be particularly indicated however for multi-cartridge distributors, given 25 the rapidity of fitting the cartridges onto the

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connectors of the distributor.

* * *

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CLAIMS

1. A cartridge connecting system for combustible gas distributors, wherein the connecting means (2) is connected to a delivery means of the distributor and 5 wherein the cartridge (1) is detachably secured to the connecting means (2), characterized in that the cartridge (1) is secured to the connecting means (2) by means of a bayonet coupling (6, 8, 10-15).

2. A cartridge connecting system according to claim 10 1, wherein, in order to produce said bayonet coupling, the connecting means (2) comprises a head (8) bearing an annular series of projections (10) and the cartridge (1) comprises a seat (6) with an annular series of reliefs (11), the projections (10) and the reliefs (11) being 15 detached from one another in one angular position of the cartridge (1) with respect to the connecting means (2), and the projections (10) and the reliefs (11) being secured axially and rotationally with respect to one another in another angular position of the cartridge (1) 20 with respect to the connecting means (2).

3. A cartridge connecting system according to claim 2, wherein each projection (10) comprises a recess (14) and each relief (11) engages in the recess (14) in the position in which the cartridge (1) is secured to the 25 connecting means (2).

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4. A cartridge connecting system according to claim 3, wherein each projection (10) comprises in succession a first portion (12) lying substantially in a plane perpendicular to an axis (X) of the connecting means (2) 5 about which the cartridge (1) rotates for connection, a second portion (13) inclined with respect to said plane, and a third portion (14) shaped as a recess, and wherein each relief (11) comprises an engagement portion (15) adapted to be inserted into the recess portion (14) in 10 said securing position.

5. A cartridge as described in the cartridge connecting system according to any one of the preceding claims.

6. A cartridge according to claim 5, comprising, at 15 the level of the area of connection to the connecting means (2), a valve (7) which regulates communication between the inside of the cartridge (1) and the outside, wherein the valve (7) is provided with a closure means (20) maintained resiliently in a closure position and 20 movable from said closure position for the loading of combustible gas into the cartridge (1) or, once the cartridge (1) is connected to the connecting means (2), for the release of combustible gas towards the distributor through the connecting means (2), and wherein 25 the valve (7) further comprises a valve element (24)

.18.

that can be operatively unblocked during the first charging of combustible gas into the cartridge (1), and movable, once in operation, between a position in which it prevents the flow of gas from the outside to the 5 inside of the cartridge (1) to prevent re-charging of gas, and a distant position in the case of reverse gas flow.

7. A cartridge according to claim 6, wherein said closure means (20) is maintained in the closure position 10 by a spiral spring (21) and said valve element consists of a ball (24) locked in a constriction (23) of the spiral spring (21) and unlocked by the action of the displacement of the closure means (20) from the closure position.

15 8. A cartridge according to claim 7, wherein the displacement of the closure means (20) exerts a thrusting action on the ball (24), releasing it from the constriction (23) of the spiral spring (21).

9. A cartridge according to any one of claims 5 to 20 8, the structure of which comprises a container (3) closed at the top by a dome (5).

10. A cartridge according to claim 9, when dependent on any one of claims 6, 7, 8, wherein the dome (5) comprises a seat (6) in which the valve (7) is inserted.

25 11. A cartridge according to claim 9 or 10, wherein

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the dome (5) has, at the level of the connecting area, a series of concentric annular ribs (22).

12. A cartridge according to any one of claims 9, 10, 11, wherein the lower edge (29) of the base (4) of the 5 container (3) is formed into a kerb.

13. A cartridge according to any one of claims 9 to 12, wherein the container (3) has a base (4) of smaller dimensions with respect to the remainder of the container (3).

10 14. A cartridge according to any one of claims 6 to 13, comprising, at the level of the valve (7), a threaded portion (26) for the connection of the cartridge (1) to a screw connecting means of a distributor.

15 15. A cartridge according to claim 14, wherein said threaded portion (26) is provided on the outer jacket (25) of the valve (7).

16. A connecting means as described in the cartridge connecting system according to any one of claims 1 to 4.

17. A connecting means according to claim 16, wherein 20 a pin (3) is provided for the opening of a valve (7) of the cartridge (1), permitting the flow of combustible gas from the cartridge (1) to the distributor.

18. A connecting means according to claim 16 or 17, wherein a non-return valve (37, 38, 39) is provided which 25 prevents the flow of combustible gas from the distributor

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to the cartridge (1).

19. A connecting means according to claim 18, wherein said non-return valve comprises a diaphragm closure means (37) maintained resiliently in the closure position by a 5 spiral spring (38).

20. A connecting means according to any one of claims 16 to 19, wherein a valve element (35) is provided that is movable by the thrust of the combustible gas between a first closure position, in which it prevents the flow of 10 gas from the distributor to the cartridge (1), and a second closure position, opposed to the first, in which it prevents the flow of gas from the cartridge (1) to the distributor in the event of over-pressure of the gas or of tipping of the connecting means (2), said valve 15 element (35) being maintained in an intermediate position between said two closure positions in the normal conditions of flow of the gas from the cartridge (1) to the distributor.

21. A connecting means according to claim 20, wherein 20 in said intermediate position the valve element (35) intercepts the gas, functioning as a flow limiter.

22. A connecting means according to claim 20 or 21, wherein said valve element consists of a ball (35).

23. Connecting means according to any one of claims 25 16 to 22, wherein a sealing gasket (36) is provided which

.21.

is interposed between the cartridge (1) and the connecting means (2) when they are connected, in order to prevent escapes of combustible gas.

* * *

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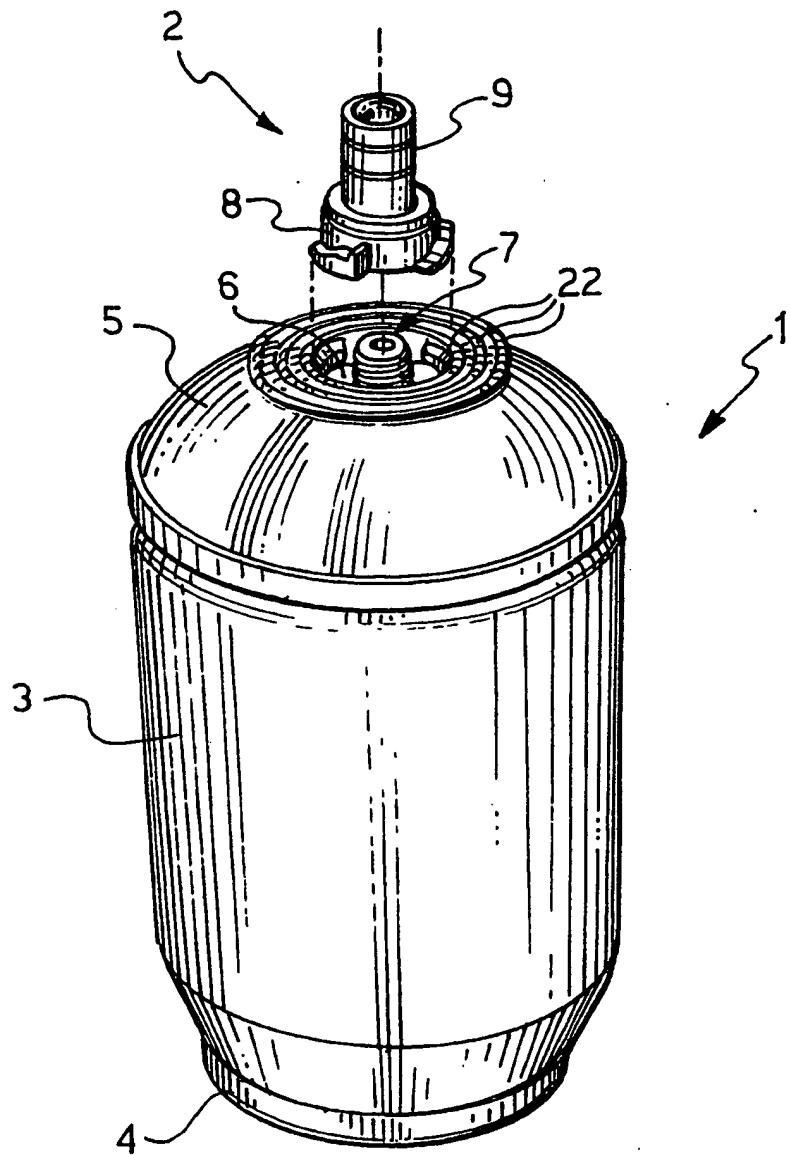


FIG. 1

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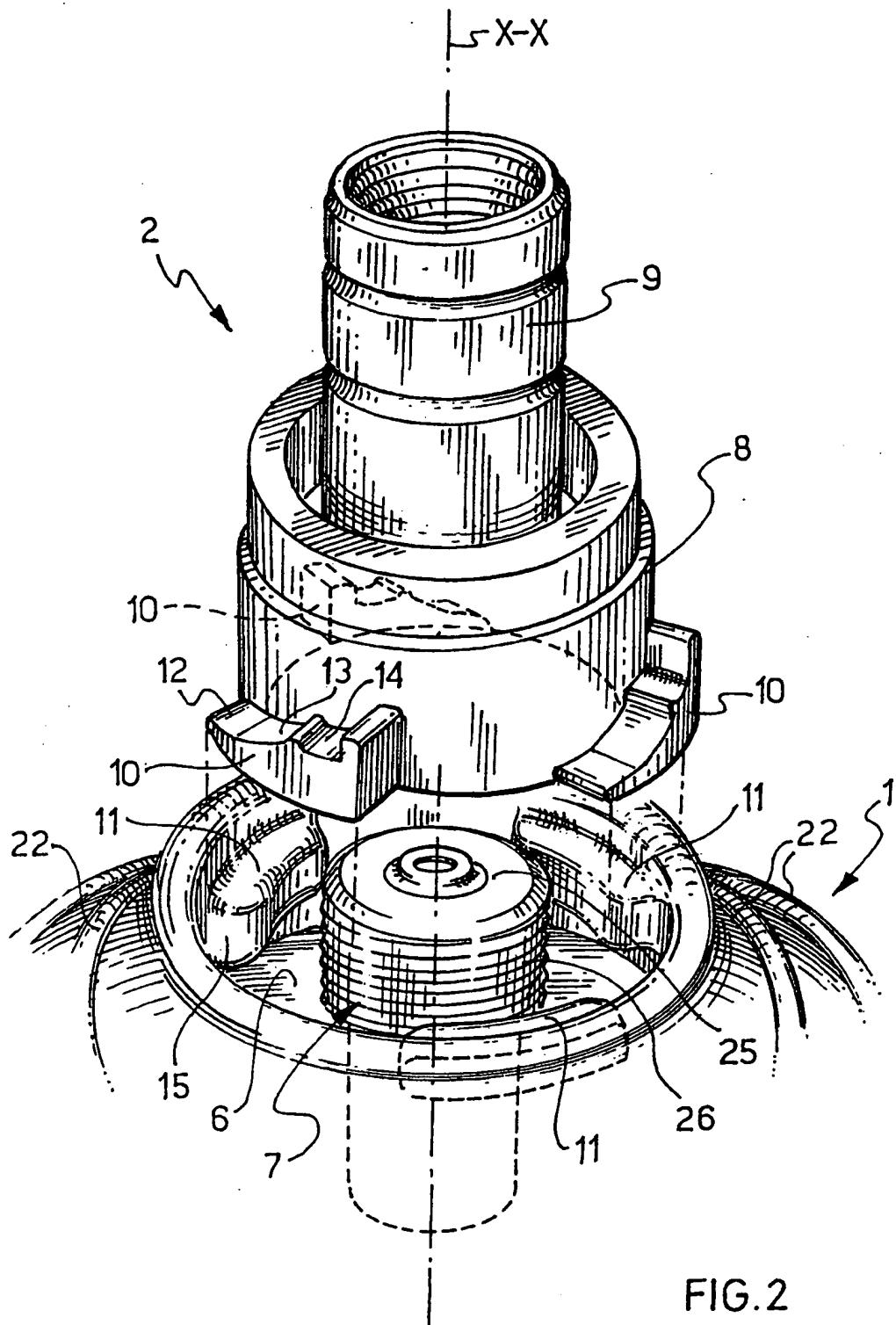
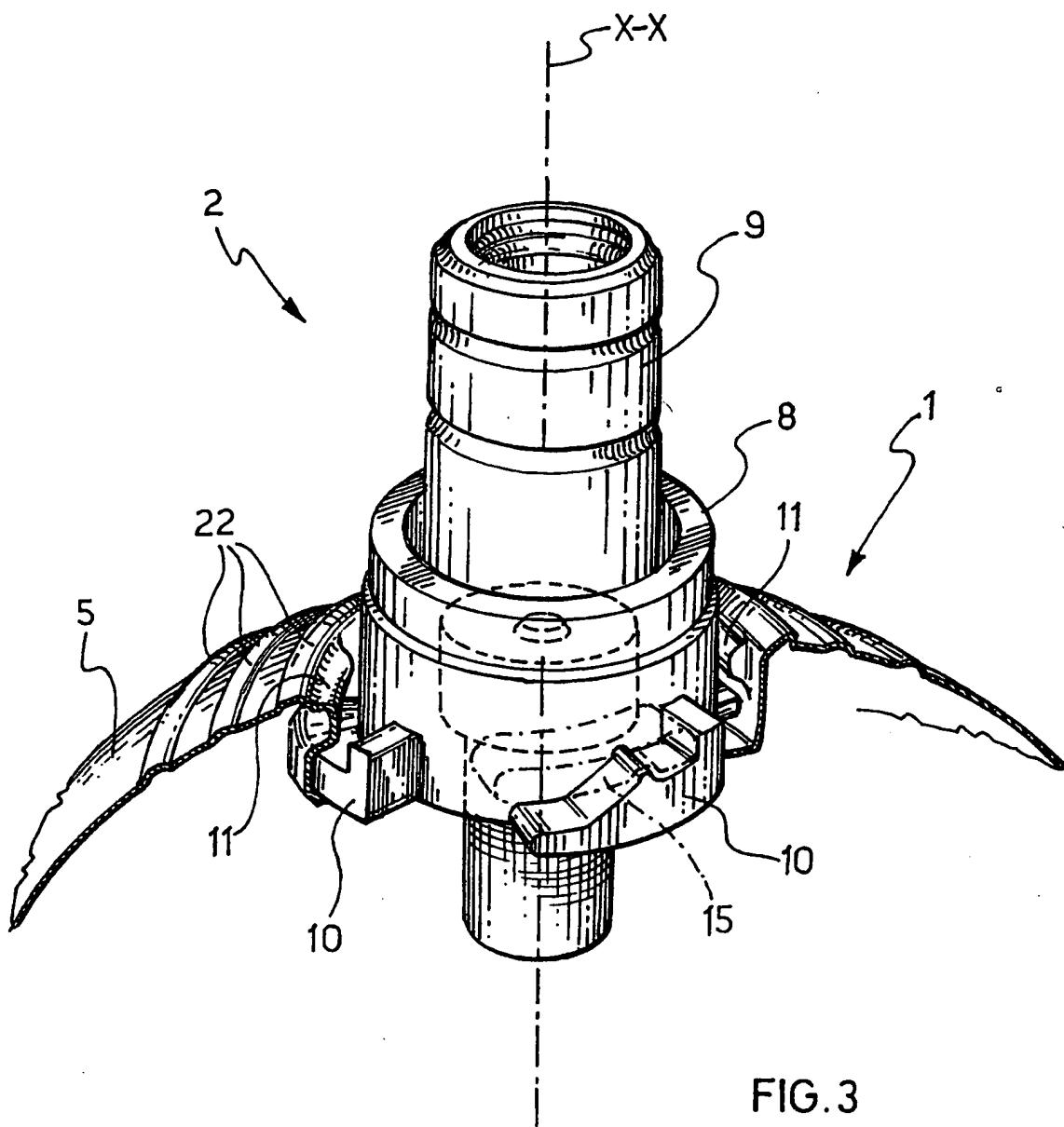


FIG.2



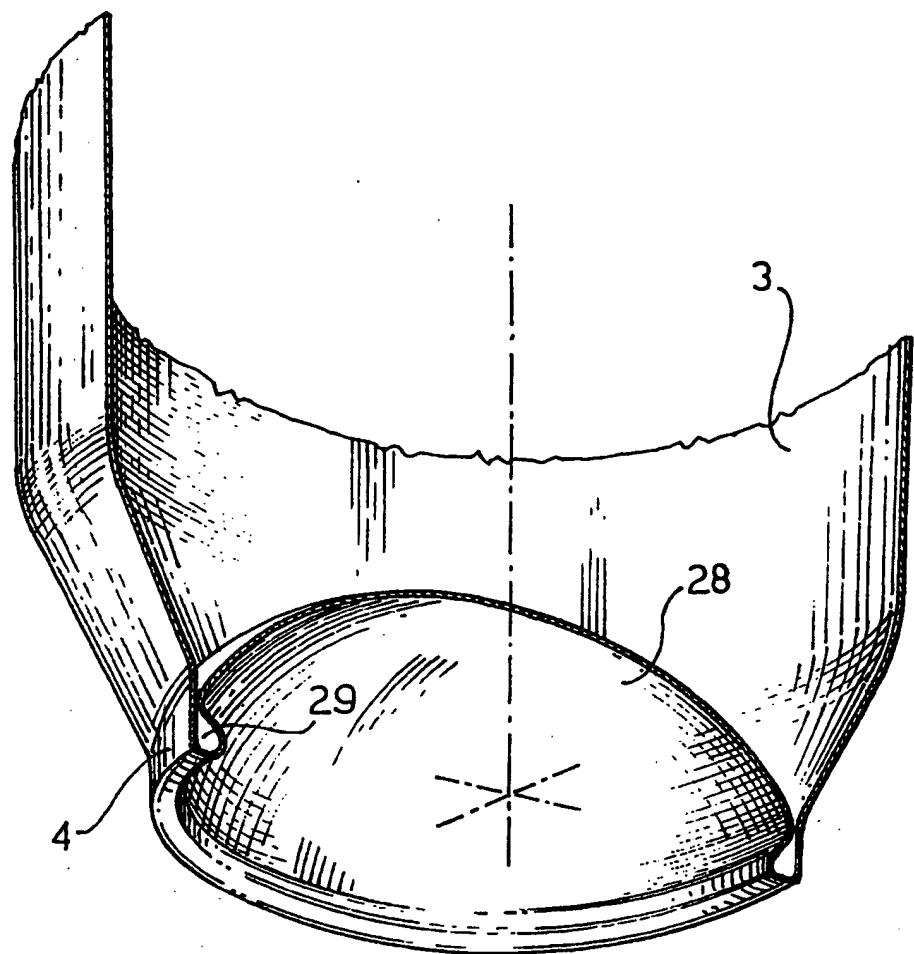


FIG. 4

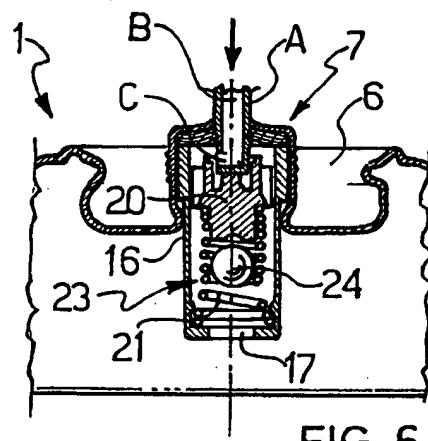
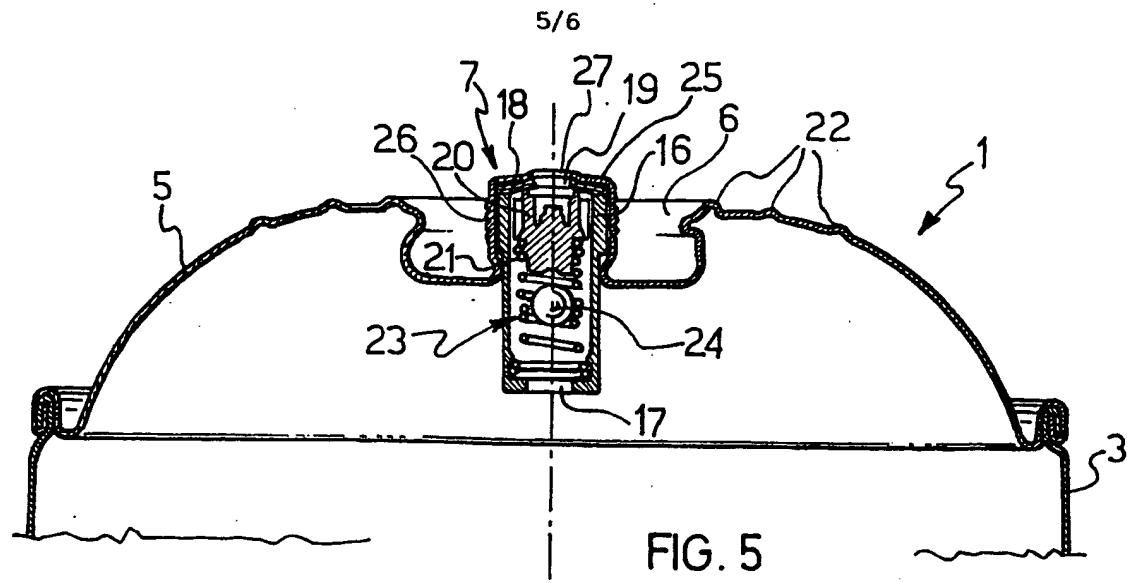


FIG. 6

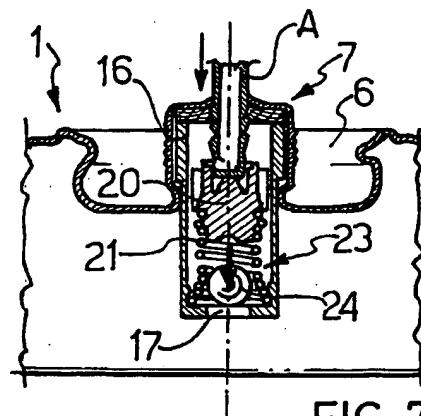


FIG. 7

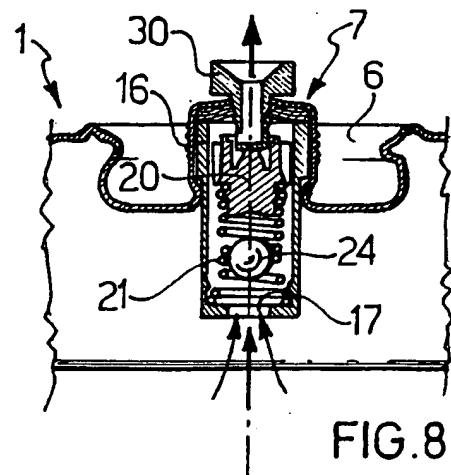


FIG. 8

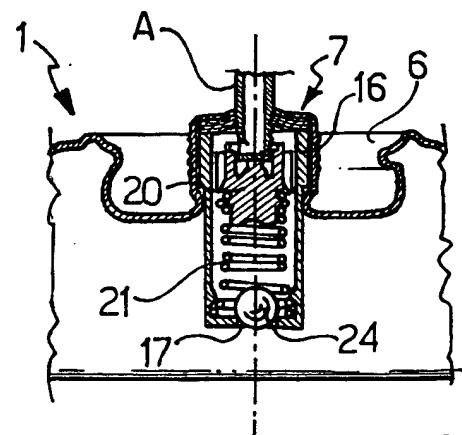


FIG. 9

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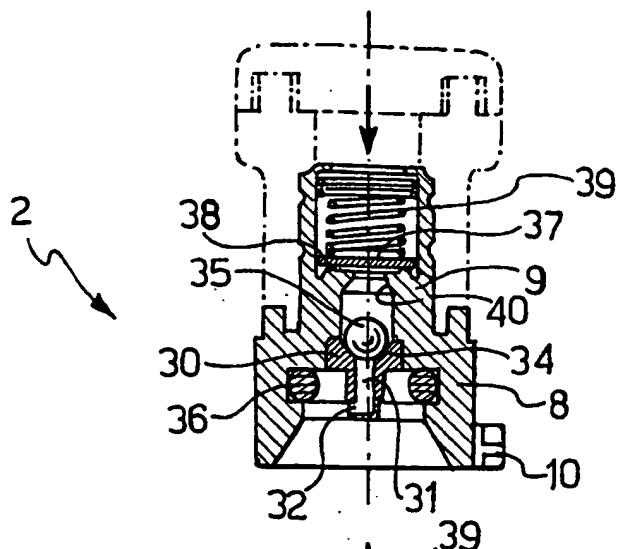


FIG. 10

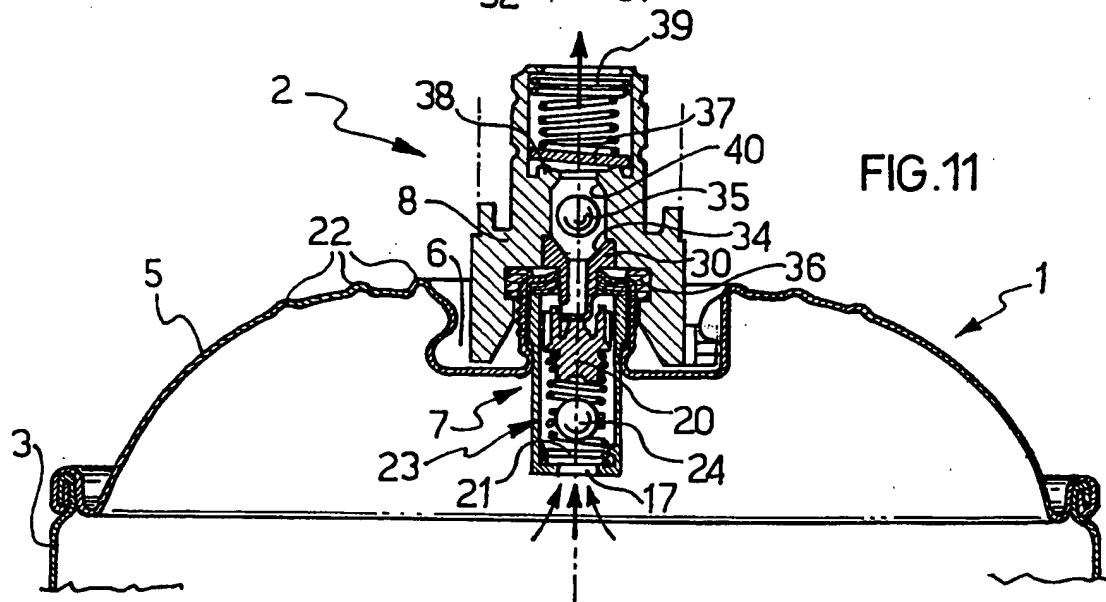


FIG. 11

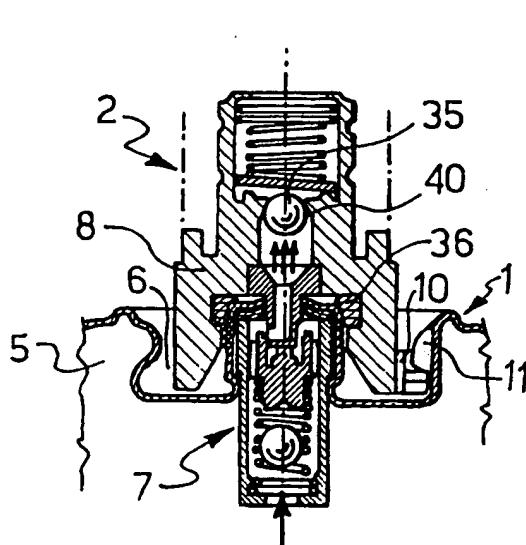


FIG. 12

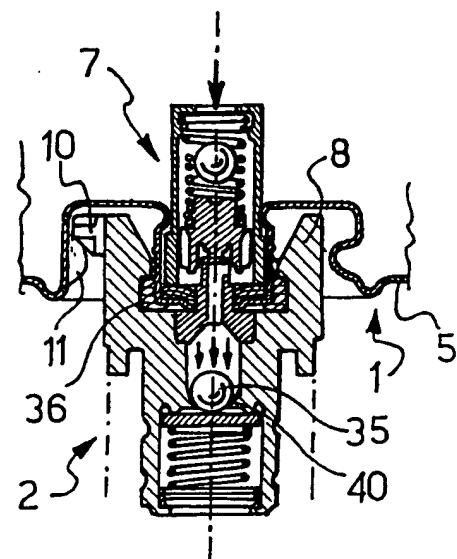


FIG. 13

INTERNATIONAL SEARCH REPORT

.onal Application No
PCT/IT 99/00360

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F17C13/00 F17C13/04 F17C1/00 F16L37/248

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 F17C F16L F24C B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 06629 A (KNODT MICHAEL ;LONG NORRIS R (US); MAY RANDALL L (US); COLEMAN CO) 19 February 1998 (1998-02-19) especially pages 29, 30 and figures 27-32 ---	1-3,5,16
X	US 5 413 386 A (DAL PALU ATTILIO) 9 May 1995 (1995-05-09) column 3, line 37 to column 4, line 66 and figures 3-6 ---	1-3,5
X	US 5 330 154 A (MASHBURN JAMES S ET AL) 19 July 1994 (1994-07-19) the whole document, especially column 3, lines 3-25 and figures 2-6 ---	1,5,16

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

4 October 2000

Date of mailing of the international search report

12.10.2000

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 305 925 A (VOGEL GUENTER M) 26 April 1994 (1994-04-26) the whole document ---	6-8
A		9,10, 13-15
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INTERNATIONAL SEARCH REPORT

International application No.
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Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-5

BAYONET COUPLING SECURING A CONNECTING DEVICE TO A COMBUSTIBLE GAS CARTRIDGE

2. Claims: 6-8

GAS CARTRIDGE VALVE TO PREVENT RE-CHARGING

3. Claims: 9-15

CARACTERISTICS OF A GAS CARTRIDGE (RIBED DOME, KERB, THREADED HEAD)

4. Claims: 16-23

CONNECTING DEVICE FOR A GAS CARTRIDGE WITH VALVES (NON RETURN, FLOW LIMITER)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/IT 99/00360

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.9.

valve 7 (indicated in Fig. 5) and moves the closure means 20 away from the hole against the action of the spring 21, said pin 30 acting like the nozzle A in the charging phase. The resilient force exerted by the spring 21 on 5 the closure means 20 is transmitted, through the pin 30, to the connector 2 and tends to move the connector away from the cartridge 1; consequently the projections 10 and the reliefs 11 are pressed against one another by said resilient force which maintains them in said engagement 10 position. The sizing and the arrangement of the projections 10 and of the reliefs 11 are such that the angle of rotation necessary for connecting the cartridge 1 to the connecting means 2 is about 60°.

With reference to Figures 8 and 11, once the 15 cartridge 1 is connected to the connector 2, the combustible gas flows from the cartridge to the connecting means through the inner hole 17 of the valve 7, through the inner part of the valve itself, and then through the hole 32 and the conduit 31 (both indicated in 20 Fig. 10) of the pin 30 of the connecting means; the ball 24 is pushed by the gas pressure against the constriction 23 of the spring 21. From the connector 2 the combustible gas flows into the distributor, lifting the ball valve 35 from its seat 34 and lifting the diaphragm valve 37 from 25 its seat 38 against the action of the spring 39.